## ANOTHER ANT GENUS HOST OF THE PARASITIC FUNGUS LABOULBENIA ROBIN.

(HYMENOPTERA: FORMICIDAE)

In a paper published in 1946 (Proc. Ent. Soc. Wash. 48:29-31) I listed all the North American ants known to be hosts of the parasitic ant fungus, *Laboulbenia formicarum* Thaxter. This list of 18 forms included one each of *Prenolepis* and *Polyergus*, two of *Lasius* and 14 of *Formica*. In 1949 Cole (Ent. News 60:117) listed two additional forms as hosts of the fungus, *Lasius sitkaensis* Perg. and *Formica parcipappa* Cole. If one follows the latest usage of names as given in 1958 (Hymenoptera of America North of Mexico Synoptic Catalog, First Supplement, U. S. Dept. of Agr. Monogr. No. 2, pp. 108-162), these 20 hosts would be reduced to 16 because of recent synonymies.

Recently I received for determination a number of workers of the honey ant, *Myrmecocystus mimicus* Whlr., infected with a parasitic fungus believed to be *L. formicarum*. The ants were collected by J. Durkin at the White Sands Missile Range, Otero County, New Mexico, May 3, 1960. Dr. Leland Shanor, Department of Biological Sciences, Florida State University, Tallahassee, Florida, confirmed my tentative identification of the fungus as *Laboulbenia formicarum*. The record is of more than usual interest as it represents the first time that the fungus has been reported from a species of *Myrmecocystus*. This is the fifth genus of ants found infected with the fungus. Perhaps it is more than a coincidence that all of these genera belong to a single subfamily, Formicinae.

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## A NEW GENUS AND SUBFAMILY OF THE DIPLOPOD FAMILY NEMASOMATIDAE FROM THE PACIFIC NORTHWEST[1]

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Of the four families of juliform diplopods presently referred to the suborder Paraiulidea [= superfamily Arthrophora Verhoeff, 1930], the Paeromopodidae and Zosteractiidae are so far known only from the Nearctic region. The other two families are more widely distributed in the northern hemisphere, but are essentially vicarious in that the Paraiulidae is chiefly American with a few genera in eastern Asia, the Nemasomatidae [= Blaniulidae of European work-

[1]This study was undertaken with the aid of a grant from the National Science Foundation.

ers] dominantly Palearctic with a scattering of endemic forms in boreal America.

At the present, four supposedly endemic species referable to the Holarctic genus *Nemasoma*, and one each in the endemic genera *Tiviulus* and *Ameractis* are on record from North America, as well as half-a-dozen introduced and established forms. None of the native species has been sufficiently well described to permit a confident appraisal of its characters, but all seem to be closely related to the Palearctic representatives of *Nemasoma*. The recent discovery in Oregon of a nemasomatid species which differs strikingly from all previously known members of the family is therefore a matter of considerable interest, the more so since the differences are great enough to require the establishment of a new subfamily. Indeed, judged from the characters utilized in the definition of the existing two subfamilies of the Nemasomatidae, some authors might not hesitate to propose a separate new family to receive the Oregon species. But inasmuch as numerous additional nemasomatids assuredly remain to be discovered in this country as well as in eastern Asia, with inevitable disruptions of the classification ensuing, I think that a conservative approach to the disposal of the new genus is desirable.

Our present knowledge of this interesting milliped is due to the interest and kindness of Mr. Richard M. Brown, Assistant Naturalist, Crater Lake National Park, who sent it among other specimens for identification and study.

## Family **Nemasomatidae**

### **Aprosphylosomatinae**, new subfamily

Differing from all other known nemasomatids by the following characters: 1, tibiae of legs of the anterior half of body distally perforate, with large eversible spongose tibial pads, the tarsi of these legs placed subterminally on the dorsal side of tibiae (figure 6), 2, first legpair of males strongly reduced, with the elements coalesced into a single structure which retains something of the original shape of the legs, sternite, and sternal apodemes (figure 4), the telopodite remnant in the form of a slender projection which inserts into a cavity between the gnathochilarium and mandible on each side. 3, telopodite of anterior gonopods slender and longer than the slightly arcuate coxal elongations, 4, gnathochilarial stipes with but one macroseta on the distolateral edge instead of two, and 5, mandibles with six pectinate lamellae instead of only four.

This subfamily differs also from the Nemasomatinae in the simple, laminate posterior gonopods and in the absence of flagella from the anterior pair; and from the Blaniulinae in having a two-lobed penis, coxites of the anterior gonopods widely separated, and unmodified mandibular stipes in the males.

### **Aprosphylosoma**, new genus

*Type species.—Aprosphylosoma darceneae*, new species.

*Diagnosis.*—With the characters of the subfamily. Other features probably of generic significance are included in the definition of the type and only known species.

### Aprosphylosoma darceneae, new species

(Figs. 1-9)

*Holotype.*—Adult male, U. S. National Museum Myriapod Catalog No. 2660, Diplopod Collection No. D-578, and Type Slides Nos. 3, 4; from Oregon Caves National Monument, Josephine County, Oregon, "ca. 200 yards northeast of water reservoirs along Big Tree Trail." August 13, 1956, Martin A. Piehl, leg.

*Diagnosis.*—Both pairs of gonopods well developed, each pair with distinct sternite; coxae of anterior gonopods partially coalesced at base along the median line, the distal elongation curved distolaterad and thence abruptly distomesad with an acute retorse projection; telopodites distinct, long, slender, distally clavate and with a subterminal row of setae on the anterior face. Posterior gonopods simple, the coxae fused with the small sternite, no remnant of a suture between coxal and telopodital elements, the gonopod flattened and lamellate, distally modified into a short curved process from the lateral margin, an apically acute median continuation of the gonopod, and a hyaline median plate, its upper margin subtended by a laciniate-dentata hyaline ridge.

*Description of holotype:* A small, slender, juliform species, 1.0 mm in diameter and about 16 mm long (broken), with 59 segments.

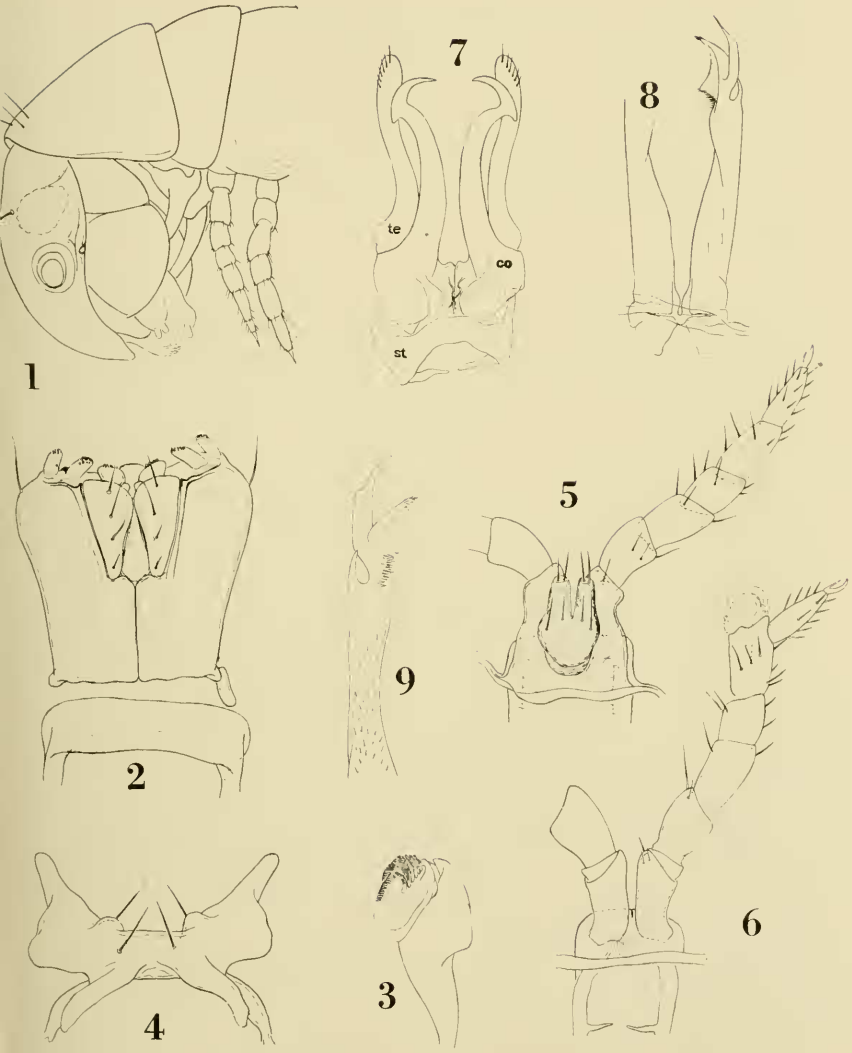
General color yellowish brown, with the median portion of the metazonites darker purplish-brown; prozonites each with a pair of slender, oblique, paramedian yellow marks, and a much larger, vertically elongated, areolated yellow spot around each ozopore. Legs white; extreme caudal margin of each metazonite testaceous.

Head distinctly convex and smooth, but slightly flattened between the ocellaria, glabrous except for a macroseta at the median angle of each ocellarium. The latter small—about as large as an antennal socket—and subreniform, with about 24 small and widely spaced ocelli in 4 or 5 rows. Interocular and median vertigial sutures deep and distinct. Labrum with five teeth, the lateral two smaller than the others.

Mandibles large and prominent, the stipes evenly curved and extending beyond sides of cranium, their ventral margin evenly curved and not produced into a terminal dentation. Each mandible with six pectinate lamellae, decreasing in size toward the dentate lamella.

Gnathochilarium typical in shape for the family, the mentum about twice as long as its basal width; lingual lamellae each with four setae. Distal aperture of salivary ducts heavily sclerotized and prolonged lateral behind base of the stipital palps. Each stipe with only one macroseta on the distolateral margin (apparently a unique condition in the family). Intermental sclerites not visible in the preparation and possibly absent; postmental elements apparently fused with the gular plate and represented only by the rounded distolateral corners of the latter. Margins of stipes slightly concave, and contributing, with the correspondingly concave adjoining margins of the mandibular stipes, to a distinct cavity on each side of the gnathochilarium.

First pair of legs reduced to a single heavily sclerotized structure, in which the outlines of the original sternite, sternal apodemes, and legs are retained although no sutures are evident. As shown in figure 1, the leg remnants project cephaloventrad and insert into the cavities on each side of the gnathochilarium.




*Aprosphylosoma darceneae*, n. sp. Fig. 1, ventrolateral aspect of head and first three body segments showing form of mandibles and appendage of the second segment (only largest setae on collum shown); fig. 2, gnathochilarium; fig. 3, distal elements of mandible, internal aspect; fig. 4, appendage of second segment (1st leg pair); fig. 5, caudal aspect of 2nd leg pair; fig. 6, anterior aspect of 3rd leg pair; fig. 7, anterior gonopods, cephalic aspect; fig. 8, posterior gonopods, caudal aspect; fig. 9, distal half of a posterior gonopod, more enlarged, anterior aspect. Abbreviations: *co*, coxite; *st*, sternite; *te*, telopodite.

Second pair of legs (figure 5) with six podomeres, the coxae fused with the sternite. Penis large and conspicuous, somewhat obcordate in form, with two divaricate distal lobes, each with two terminal setae and two basal setae.

Legs 3-7 subsimilar, of the form shown in figure 6, the tibia distinctly enlarged and cylindrical, the entire distal end perforate and containing an eversible membranous subtarsal cushion; the tarsus of these legs set on the dorsal side of the tibia to accommodate this modification.

Collum smooth and symmetrical, its surface irregularly set with numerous fine short setae, which increase in size and length toward the middle of the anterior margin. Lateral marginal ridge present, but no other surficial striation evident.

Pleurotergites of all but the last body segment with a distinct dorsomedian suture; prozonites smooth and polished, metazonites distinctly ribbed entirely around body (imparting a strikingly paeromopoid appearance), the costulations becoming strongest dorsally, and slightly convergent anteriorly near the median suture. Caudal margins of segments with a row of numerous short fine setae.

Anal segment smooth and polished, only slightly produced medially into a very short epiproct, its caudal margin with six macrosetae, two laterals on each side and two paramedian, the latter accompanied by several shorter epiproctal setae, and preceded dorsally by two larger setae near the middle of the segment. Paraprocts smooth, convex, their mesial margins meeting at a re-entrant angle, each with two submarginal setae. Hypoproct distinct, smooth, its free margin subcircular.

All sternites apparently free from pleurotergites or at most very loosely attached; the two sternites of each segment approximately equal in size. Legs slender and of moderate length, the distal half of the tarsi being visible from above when legs are extended laterad. Tibial pads occur back to about the 40th segment, their shape changing from subglobose on the anteriormost legs to more elongate and subacute, the tarsi simultaneously shifting to an apical rather than dorsal position on the tibiae.

Gonopods of moderate size, the basal half of each pair concealed within the body. Of the form shown in figures 7-9, the gonopods differ from those of all other nemasomatids, the anterior pair similar to those of the Nemasomatinae, except for lacking a pair of flagella, the posterior elements resembling their homologs in the Blaniulinae although shorter and flatter.

*Remarks.*—Although considerable convergence is to be expected in the Nemasomatidae as regards characters of taxonomic significance, it is certainly possible to draw some inferences from the structure and distribution of the known species.

The first pair of legs is subject to drastic modification throughout the family. The presumably primitive condition, in which these legs are most like the following limbs, is largely restricted to the subfamily Nemasomatinae. Here the appendages are composed of six articles (the basalmost fused with the sternite, however), and the tibia is provided with a short, acute, retrorse process on the mesal side. The tarsus is slender and fairly long, and carries a normal pretarsus. A second stage in the evolution of these legs involves shortening and thickening of the articles with reduction of the pretarsus and replace-

ment of the tibial process by a blunt peg-like structure. This general form occurs in most genera of the Blaniulinae. *Borcoiulus,* of that subfamily, carries the modification further, with the coxae fused to each other as well as to the sternite, and the telopodites reduced to short, broad, completely fused monoarticular remnants each of which bears a small subglobose terminal article (tarsus?). One genus of each subfamily has the telopodites of the 1st legs reduced and fused into uncate processes, the coxites remaining unmodified, and the occurrence of this form in otherwise widely differing genera is certainly an example of independent convergence of characters. As already remarked, the singular structure of the 1st legpair in *Aprosphylosoma* is a considerably more extreme specialization than in other known genera.

The unspecialized condition of the male gonopods, presumably, is that in which the anterior pair is equipped with flagella, and the posterior pair retains the segmentation of sternite, coxites, and telopodites. The genera of the Nemasomatinae, for the most part, meet these stipulations; in the Blaniulinae the flagella are lost and the posterior gonopods consist of but a single article distad to the sternite. *Aprosphylosoma* partakes of the characters of both groups in this respect, its posterior gonopods approaching those of the Blaniulinae. Although the anterior gonopods have no flagella, the coxal prolongations are relatively small and short, without any approach to the blaniuline character of enormous elongation and fusion into a slender median projection which far overreaches the reduced telopodites.

From the distributional point of view, the Nemasomatinae are represented in Europe, eastern Asia, and boreal America by only a few genera, which are comparatively very poor in number of species. Genera of the apparently more specialized Blaniulinae are largely confined to the Western Palearctic region, particularly in the circum-Mediterranean area, and perhaps constitute a successful adaptation to warm climate by a branch of the older, holarctic ancestral nemasomatid stock which is at present apparently reduced to nearly relict status in high latitudes.

*Aprosphylosoma* is in general still rather enigmatic with respect to its evolutionary position, having generalized gonopods and mouth parts, but specialized 1st male legs and hypertrophied tibial pads. One observation can be made with some assurance, however—that the genus constitutes the closest known link between the families Nemasomatidae and Paraiulidae, and also bears a striking superficial resemblance to the Paeromopodidae. One major difference between the first two groups named has been the number of pectinate mandibular lamellae: four in the Nemasomatidae and seven or eight in the Paraiulidae. *Aprosphylosoma* bridges the gap with six lamellae, and the form of the male gonopods is not significantly different from that found in several paraiulid genera of the Pacific Northwest region. The knowledge of this interesting annectant species permits the inference that other related forms will be discovered in the region where

the three American families of the Paraiulidea are sympatric, and that, perhaps, the distinction between them will be found to dissolve.

That the nemasomatids and paraiulids are closely related has been appreciated for a long time, Count Attems in particular having maintained the two groups as coordinate subfamilies. At the present the distinction between them lies largely in the form of the anterior legs of the males. There are apparently considerable differentiations in the cyphopod structure as well, but not enough paraiulid genera have been carefully studied for these characters to permit a generalization at the present.

In studying the anatomy of species of the three families mentioned above, I have found that some errors exist in the key recently published by Dr. Chamberin and me (1958, U. S. Nat. Mus. Bull. 212, p. 122) and take this opportunity to present a revised but nonetheless entirely provisional synopsis of these groups. I am by no means fully assured that the Zosteraetiidae can be maintained as a family group, for instance.

### Key to the Families of the Suborder Paraiulidea

1. Coxites and telopodites of anterior gonopods fused and immovable, although the articular suture and coxal musculature may still be evident in cleared specimens. Large species, 50-150 mm. in length, with strongly striate tergites ..... **Paeromopodidae**

   Telopodites of anterior gonopods free from coxae and at least partially movable. Smaller species, 20-80 mm. in length; tergites usually not striate entirely across dorsum ..... 2

2. Anterior and posterior gonopods very unequal in size, the anterior long and exposed, posterior very short and concealed within the body ..... **Zosteractiidae**

   Anterior and posterior gonopods not striking dissimilar in length ..... 3

3. First legs of males reduced in size and frequently abortive, composed or from 6 podomeres to a simple syncoxosternum; gnathochilarium of similar form in both sexes; 2nd leg pair of males not modified; legs usually with ventral pads on one or more podomeres; mandibles with 4 to 6 pectinate lamellae ..... **Nemasomatidae**

   First legs of males enlarged in size, with six articles; 2nd pair of legs always, and 7th pair frequently, modified; gnathochilarium of a different shape in the two sexes; legs without ventral pads; mandibles with 7 or 8 pectinate lamellae ..... **Paraiulidae**

### Reference

Brolemann, H. W., 1923. Blaniulidae (Myriapodes), Biospeologica XLVIII, in: Arch. Zool. Exper. et Gen., vol. 61, pp. 99-453, pls. I-XVI, text figs. 1-411.

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